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## **Music Therapy Research – Children with an Autism Spectrum Disorder**

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### **Summary**

There is research evidence that music therapy has a significant effect on children with an autism spectrum disorder (ASD). Cochrane reviews show that music therapy promotes verbal and especially nonverbal communication in children with ASD. Furthermore, an RCT study found that music therapy had a significant effect on development of joint attention skills in 3-6 year old children with ASD. Compared to the control group, there were more and longer events where the child experienced joy and emotional synchronicity with the music therapist, as well as spontaneously initiating engagement with the therapist.

In music therapy, children with ASD are engaged in musical interaction that facilitates imitation, turn-taking, emotional sharing and joint attention. These are basic social skills that are prerequisites for learning language. In addition to treatment, music therapy can also contribute to diagnosis of the child's ability for social engagement and nonverbal communication. Music therapy assessment is especially well suited in discriminating between children with an autism spectrum disorder and children with severe communication disorders.

### **Introduction**

There is a long tradition for music therapy with children with autism spectrum disorders. A few case descriptions date as far back as the 1940's, when autism was first described as a distinct disorder. Throughout the years and across national borders, music therapists, parents and other caregivers have seen that music therapy can make a difference for children with ASD, in the improvement of social skills, verbal and nonverbal communication (including imitation and turn-taking), emotional interaction and changes in behaviour (Reschke-Hernández 2011).

Where earlier music therapy literature is dominated by case descriptions, method descriptions and a few case effect studies, the last 10 years has seen a marked shift towards more rigorous effect studies, supplemented by research in clinical approaches designed specifically for persons with autism, based on developmental psychology. This article presents the main ideas of current music therapy practice and research, including effect studies and Cochrane reviews, as well as relevant clinical approaches in music therapy for children with ASD.

### **Autism Spectrum Disorder**

Autism Spectrum Disorder (ASD) is a lifelong, neurologically determined developmental disorder that

is characterised by fundamental difficulties in mutual social interaction, verbal and nonverbal communication, and restricted, stereotyped patterns of behaviour, interests and activities (American Psychiatric Association 2000; World Health Association 1993). It encompasses a spectrum of difficulties and degrees of severity, rather than a single condition, and the spectrum covers subgroups such as Infantile Autism, Atypical Autism and Asperger's syndrome. (In the proposed revision of the diagnostic system, DSM5, in 2013, the subgroups are joined into one category, divided into degrees of severity according to the child's specific level of functioning (Jørgensen & Jørgensen 2011).)

A child with autism can often have other disorders, such as cognitive difficulties and/or physical, behavioural or emotional difficulties. The prevalence of an autism diagnosis is estimated as 10-15 children per 10.000, while more than 20 children per 10.000 have a dysfunction within the autism spectrum (Wheeler, Williams, Seida & Ospina 2008). These numbers are subject to uncertainty, however, as several studies show a much higher prevalence of ASD (Rossignol 2009). Four times as many boys as girls are diagnosed with ASD.

At this point in time, it is not possible to prevent or cure an autism disorder. However, quite a number of therapeutic approaches and interventions exist. Some of these aim to reduce the difficulties typically associated with ASD such as insomnia, hyperarousal and concentration difficulties, while others aim to support the child's potential to develop social skills, language skills and cognition (Autism Intervention Research Trust 2006-2011; Rossignol 2009; Wheeler et al. 2008).

### **Documented effect**

The great range of interventions and treatment approaches have created a need for research evidence as to their effect, through Cochrane reviews, where effect studies are compared using well-defined validity criteria (see explanation in fact box).

In an analysis of a number of Cochrane reviews on interventions for ASD, Wheeler, Williams, Seida & Ospina (2008) compared Cochrane reviews on medicinal approaches, behavioural and educational interventions, sound therapies (such as music therapy) complementary therapies (such as diet), and speech and occupational therapies. Wheeler et al. concluded that only the Cochrane reviews concerning treatments with Risperidone, Parent-mediated early intervention, and *Music Therapy* showed a statistically significant effect. The effects were seen in communication skills, speech and/or specific types of behaviour associated with ASD.

In a systematic review of **current interventions** for children with ASD, Rossignol (2009) concludes that *music therapy* – along with certain new medications – rates highest in delivering research evidence of effect of treatment. Similarly, the British research centre, Research Autism, concludes that there is strong research-based evidence for the effect of *music therapy* for children with ASD (Autism Intervention Research Trust 2006-2011).

These reviews reveal only whether or not the different interventions are based on valid research. Effective treatment approaches can exist that are not included in Cochrane reviews, because of lack of

research or the requirement of a control group (see RCT in the fact box). On the other hand, it can be concluded that there is research evidence that music therapy with children has a significant effect, and that music therapy, in comparison with other kinds of treatment, has a solid research base.

The above-mentioned Cochrane review on music therapy for children with ASD shows that music therapy improves nonverbal communication skills significantly for children with ASD, compared to control groups, where children with ASD participate in similar stimulating activities such as play or storytelling (Gold, Wigram & Elefant 2006). An example of the type of nonverbal communication measured is gestural imitation of a sign or movement. Furthermore, the Cochrane review shows that music therapy improves verbal communication skills significantly for children with ASD, compared to the control group. However, the degree of effect (change from before to after music therapy) is less in verbal communication than nonverbal. Similarly, in a later RCT study, a significant improvement of nonverbal communication in children with ASD was found, compared to the control group (Gattino, Riesgo, Longo, Leite & Faccini 2011).

In a RCT study from 2006, Kim goes further to investigate the effect of music therapy in developing joint attention skills<sup>1</sup> in 3-6 year old children with ASD (Kim, Wigram & Gold 2008). Difficulty initiating and maintaining joint attention is one of the fundamental characteristics of children with ASD (Mundy & Sigman 2006). A clear correlation between the development of imitation, joint attention and language in children with ASD has also been shown (Mundy, Sigman & Kasari 1990; Schuler, Prizant & Wetherby 1997).

In Kim's RCT study, children with ASD receiving music therapy were compared with a control group that participated in free play with toys with an adult. The study showed that music therapy was more effective in facilitating joint attention and nonverbal social communication than free play, as measured by the Early Social Communication Scales (ESCS) (Mundy, Delgado, Block, Venezia, Hogan & Seibert 2003). In addition, video analyses of the sessions revealed significantly more and longer events of eye contact and turn-taking in music therapy than in play sessions (Kim et al. 2008). More specifically, the analyses showed that children in music therapy produced markedly more and longer events of 'joy' and 'emotional synchronicity' than in free play with an adult, which automatically influenced the degree to which they 'spontaneously initiated engagement'. From these results, we can conclude that there is evidence that music therapy facilitates motivation, as well as social and emotional development in children with ASD (Kim, Wigram & Gold 2009).

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Joint attention refers to behavioural traits that indicate a child's wish to share experiences with another, for example by shifting gaze back and forth between a caregiver and an object (normally around 6-9 months), using sounds or pointing (from 9 months) and, last but not least, by smiling at the caretaker when successful.

The above-mentioned RCT studies all compare music therapy with similar interventions (control groups), but do not take into account frequency of treatment. In an ongoing RCT study with children with ASD, Geretsegger compares weekly music therapy sessions to music therapy three times a week, using The Autism Diagnostic Observation Schedule (ADOS; Lord, Rutter, DiLavore & Risi 2001). The aim is to investigate whether increased frequency improves the effect of the treatment significantly (Geretsegger, Holck & Gold 2012).

### **Reasons for the effect of music therapy**

An infant is born with a 'communicative musicality', which reaches far back in the history of humanity and thus the evolution of the brain (Malloch & Trevarthen 2009). Even the earliest interactions between parents and infants contain pulse, rhythm, timing, timbre, melodic movement and attunement (e.g. Stern 2000). These traits make the infant capable of participating in nonverbal interaction, which is a prerequisite for early attachment (Hart 2006). In music therapy it is possible to create an intensified musical version of early interaction, and in this way support attention, communication and social interaction in children, who, for different reasons, have problems with these skills (Holck 2007).

For a child with a severe autism disorder, the first step is to attract and maintain the child's attention. Music and musical instruments are attractive to most children with ASD. We know this from music therapy literature, but also from personal accounts from adults with ASD and parents of children with ASD, as well as research in stimulus preferences and studies done of exceptional abilities in individuals with ASD (see Holck 2002). The appeal of music and instruments makes it possible to hold the child's attention, which is a prerequisite for any interaction. After this, the aim of music therapy is to direct the child's interest towards social interaction through musical play with the therapist (Holck 2007; Kim et al. 2009; Oldfield 2006; Schumacher & Calvet-Kruppa 1999; Wigram & Elefant 2009).

In this process, several forms of musical imitation are important. Music therapists are trained in improvisation on the spot, so in contrast to music played on a CD, Ipod, etc., the music therapist can continually match the child's changing musical and physical expressiveness; follow the rhythmic pulse in the child's rocking movements, imitate pitch and timbre of the child's sounds, or match the volume and dynamic character of the child's instrumental music (Oldfield 2006; Wigram 2004; Wigram & Elefant 2009). The aim is for the child to discover the connection between his/her own music/sounds/movements and those of the music therapist, and, for example, stop when the therapist stops, or stop his/her own movement or sound, in order to see how the therapist reacts. This kind of interaction can gradually become more 'teasing', with a touch of shared (musical) humour (Holck 2002, Wigram 2004).

The importance of imitation is well described in autism research. Imitation plays a central role in engaging a child with severe ASD to take part in social interaction, and a clear correlation has been shown between imitation in children with ASD and the later development of joint attention and language skills (eg Landa 2007; Mundy et al. 1990; Schuler et al. 1997). In music therapy, imitation

takes place in a musical forum, where sounds gradually become part of small dialogues of turn-taking. Along with actual note-by-note imitation, the music therapist can match dynamics, or introduce small musical variations in a way that the child still can recognize as 'imitation'. This dialogical and expressive aspect of musical improvisation is presumably what makes music therapy more effective than toy play in engaging a child with ASD in social interaction with joint attention, according to Kim's RCT study, mentioned above (Kim et al. 2008).

Children with ASD have a great need for a predictable structure, in order to function optimally (e.g. Schuler et al. 1997). In the balance between respect for this need and the child's tendency to be inflexible in stereotypical behaviour, it is worth noting that music can be very predictable (for example by containing many repetitions). At the same time, in improvised music, there are always small variations in melody, harmony, rhythm, phrasing and dynamics (Wigram 2004; Wigram & Elefant 2009). In this way, predictability and variation are possible in the same musical expression, and the degree of variation can be attuned to the particular situation. Research in music therapy practice shows that with time, small interaction themes can develop between the child and music therapist – themes that are repeated and varied from session to session, and become the basis for play, with expectations and surprises (Holck 2002).

In Kim's RCT study, the music therapist was asked to alternate between following the child's initiatives and initiating activities herself. Results showed that when the music therapist followed the child's initiatives, there were markedly more and longer events with signs of joy and spontaneous participation from the child. This indicates – in line with the autism researchers who suggest a social-pragmatic perspective on communication (e.g. Schuler et al. 1997; Landa 2007) – that it is important to follow the child's initiatives and interpret them as communicative intentionality, especially in the early phases of the music therapy and the beginning of the specific session (Kim et al. 2009).

Because music therapy can support early communication skills and engage children with ASD in social interaction, it would be natural to reinforce this development outside of the therapy room. Therefore, quite a few music therapists involve parents and daily caregivers in music therapy, so that they can continue working with these new skills in the child's daily life (Larsen 2011; Oldfield 2006; Gattino et al. 2011). Cochrane reviews and RCT studies show that Parent-mediated Early Intervention has a significant effect (Charman 2011; Wheeler et al. 2008). So, by involving parents and caregivers, music therapy supports early communication skills in both children and adults.

For older children and youths who have developed more age-appropriate interaction and language skills (for example children with Asperger's syndrome), music therapy can strengthen the child's sense of identity and provide an opportunity to explore intersubjectivity and emotional interaction, using music (Holck 2008; Oldfield 2006; Raglio et al. 2011; Schumacher & Calvet-Kruppa 1999; Wigram 2004;). This can be done through musical stories, songwriting, musical role plays or 'play rules' with a focus on identity and emotions (Holck 2008; Irgens-Møller 1998; Oldfield 2006; Wigram 2004).

## **Assessment and diagnosis**

In addition to treatment, music therapy can contribute to diagnostic and clinical assessment of an autism disorder, through assessment of social engagement and nonverbal communication, which are central areas of difficulty for children with ASD (Holck 2008; Oldfield 2004; Raglio et al. 2011; Schumacher & Calvet-Kruppa 1999; Wigram 2007; Wigram & Gold 2006).

In a PhD study of the validity of using musical improvisation in diagnosis of children with ASD, Oldfield (2004) showed that scores of the child's behaviour in music therapy were very similar to the final diagnosis given using Autism Diagnostic Observation Schedule (ADOS; Lord et al. 2001). In cases, with children with autistic traits but without a clear diagnosis, scores from musical improvisation showed more nonverbal behaviour than was measured by ADOS.

This is in line with Wigram's research in diagnosis and assessment of difficult-to-diagnose children. His research shows that music therapy assessment is especially useful in distinguishing children with severe communication disorders from children with autism disorders (Wigram 2007; Wigram & Gold 2006). Improvisational interaction between child and music therapist can reveal the child's ability for emotional engagement and attunement, whether or not the child shows these abilities in other situations. In the autism spectrum, music therapy assessment can provide new details about the child's difficulties. Because music therapy helps children with ASD to focus their attention, they can reveal skills and resources in musical interaction that can be hidden in cognitive tests or verbal interaction (Wigram 2004, 2007; Wigram & Gold 2006).

To summarise, music therapy can reveal difficulties, as well as helping the child to improve skills in core areas specific to autism. Through engagement in joint musical activities, the child has the opportunity to develop and strengthen skills such as imitation, turn-taking, joint attention and emotional sharing – all closely related to social skills and language.

### **Fact box** – RCT studies, case effect studies and Cochrane Reviews

An **RCT study** is seen by many to be the most reliable type of research. RCT means Randomized Controlled Trial, and the aim is to evaluate the effect of a particular action through predefined objective criteria. An RCT study could, for example, be effect measurement of music therapy, compared with control treatment and/or daily practice. In order to assess whether or not there is statistical significance, precise independent variables are defined (in behaviour, conditions or abilities, for example) that are 'measured' using standardised tests or assessment tools. The same measurements are done on the experimental as well as the control group, and the two groups should be completely comparable and selected by randomly 'drawing lots'. There should be enough participants to minimize random variation.

The requirement of a control group in RCT studies poses ethical issues, especially when patients are designated to a control group after having been referred to treatment that they most probably would benefit from. Here **case effect studies** can be used to show treatment effect in improvement of the participants' condition or abilities. Instead of using a control group, the patient is his/her 'own control group', by comparing the independent variables to baseline measurements.

In **Cochrane reviews**, existing effect studies are analysed as to quality of research, and the results are then compared. Cochrane reviews are internationally recognised as the highest standard for assessing research evidence for the effect of a given treatment approach. Cochrane reviews are targeted to actors and decision makers in the health care area, in order to give them the best possible basis for decision making. Cochrane reviews are primarily based on RCT studies and are published in *The Cochrane Library*, [www.thecochranelibrary.com](http://www.thecochranelibrary.com).



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